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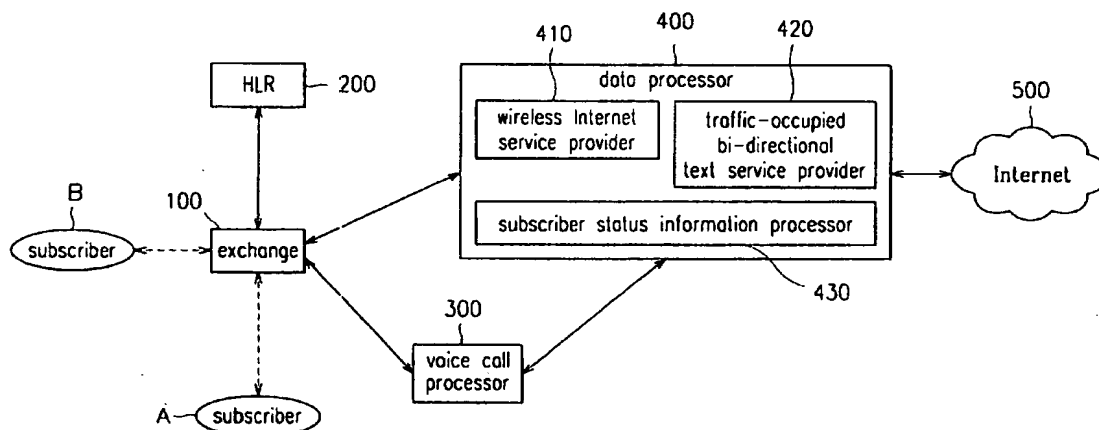
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(54) Title: APPARATUS AND METHOD FOR SELECTIVELY CONNECTING TO VOICE CALL RECEIVED DURING ROAMING WIRELESS DATA COMMUNICATION SERVICE



(57) Abstract: Disclosed is an apparatus and method for selectively connecting to an incoming voice call received during a wireless data communication service, the communication connecting apparatus including: a data processor for providing a wireless data communication service to a subscriber; an exchange for providing a speech channel between subscribers and a path between the subscriber and the data processor; and a voice call processor connected to the exchange and the data processor for processing an incoming voice call for a subscriber who is in communications, depending on whether the subscriber is in connection with the wireless data communication service provided by the data processor. The data processor informs the subscriber of the incoming voice call when the subscriber is in connection with the wireless data communication service, and causes the subscriber to decide whether to be connected to the incoming voice call. The voice call processor connects the subscriber to the incoming voice call, when the subscriber decides to be connected to the incoming voice call. The present invention allows a subscriber to receive an incoming voice communication request message from another subscriber during connection with the wireless data communication service with a wireless data terminal, and to have voice communication with the other subscriber.

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**Apparatus and Method for Selectively Connecting to Voice Call
Received During Roaming Wireless Data Communication Service**

5

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to an apparatus and method for selectively connecting to an incoming voice call received during wireless data communication. More specifically, the present invention relates to an apparatus and method for selectively connecting to an incoming voice call for
10 a subscriber who is in connection with a wireless data communication service with a wireless data terminal, the subscriber being informed of the incoming voice call and being selectively connected to the voice call.

(b) Description of the Related Art

15 The wireless data communication service using wireless data terminals (e.g., mobile communication terminal, PDA (Personal Digital Assistant), notebook computer, and other intelligent terminal), especially supporting wireless voice and data communication services, refers to a service over traffic channels, including wireless Internet service and traffic-
20 occupied bi-directional text service.

The wireless Internet service allows a terminal using HTTP (HyperText Transfer Protocol) or WAP (Wireless Application Protocol) to have access to the Internet. HTTP description languages are m-HTML (mobile-HyperText Markup Language) and c(compact)-HTML, WAP

description languages being WML (Wireless Markup Language) and HDML (Handheld Device Markup Language).

As wireless data terminals are becoming more widespread, the number of wireless Internet users using wireless data terminals is on an
5 increasing trend.

Conventionally, a communication request sent to a wireless data communication subscriber while they are communicating is difficult to be received by the recipient, and the incoming voice call is disconnected or switched to the VMS (Voice Mail System) to let the calling subscriber leave a
10 voice message.

The originating subscriber of the voice call is thus thwarted in an attempt to call the recipient subscriber. This happens more frequently as the recipient subscriber is very likely to be in connection with the wireless data communication service, especially due to the spread of wireless data
15 terminals.

With an increase in the number of subscribers to wireless data communication services, e.g., wireless Internet service, voice communications are not so easy to achieve and the actual number of successful communications decreases.

20 This is because the speech path differs from the data channel in the wireless data communication service network, as a consequence of which it becomes difficult to report, connect or switch an incoming voice call.

An approach to solve the problem is implementation of ICW (Internet Call Waiting) using VoIP (Voice over IP).

The VoIP-based technique is to convert the voice data of a subscriber originating an incoming voice call in the form of digital data to be
5 sent to a recipient subscriber who is in connection with the data communication service, based on the VoIP (e.g., H.323, MGCP (Media Gateway Control Protocol), SIP (Session Initiation Protocol), etc.), thereby connecting the voice call to the recipient subscriber.

This technique, however, requires a separate VoIP function added to
10 the wireless data terminal, the use of which is still limited for general users.

The function concerned requires many resources of the wireless data terminal and takes too much time to be of practical use in the near future.

Furthermore, the requirement of conversion of voice to digital data
15 results in limiting the data rate over the network, which deteriorates the quality of the data service.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus and method for selectively connecting an incoming voice call to a subscriber who
20 is in connection with a wireless data communication service with a wireless data terminal, the subscriber being informed of the incoming voice call and being selectively connected to the voice call.

In one aspect of the present invention, there is provided an apparatus and method for selectively connecting to an incoming voice call received during a wireless data communication service, the communication connecting apparatus including: a data processor for providing a wireless data communication service to a subscriber; an exchange for providing a speech channel between subscribers and a path between the subscriber and the data processor; and a voice call processor connected to the exchange and the data processor for processing an incoming voice call for a subscriber who is in communications, depending on whether the subscriber is in connection with the wireless data communication service provided by the data processor. The data processor informs the subscriber of the incoming voice call when the subscriber is in connection with the wireless data communication service, and causes the subscriber to decide whether to be connected to the incoming voice call. The voice call processor connects the subscriber to the incoming voice call, when the subscriber decides to be connected to the incoming voice call. The present invention allows a subscriber to receive an incoming voice communication request message from another subscriber during connection with the wireless data communication service with a wireless data terminal and have voice communication with the other subscriber.

The data processor includes a subscriber status information processor for processing the status information of the subscriber, the status

information of the subscriber includes information indicating whether the subscriber is currently in connection with the wireless data communication service, and the voice call processor inquires from the data processor whether the subscriber is in connection with the wireless data communication
5 service provided by the data processor.

In another aspect of the present invention, there is provided a communication connecting method including the steps of: (a) a first subscriber requesting a voice communication with a second subscriber; (b) determining whether the second subscriber is in communications; (c)
10 determining whether the second subscriber is in connection with a wireless data communication service if the second subscriber is in communications; (d) sending a message to the second subscriber indicating that there is an incoming voice call from the first subscriber, in a data format used in the wireless data communication service, if the second subscriber is in
15 connection with the wireless data communication service; (e) causing the second subscriber to decide whether to be connected to the voice call from the first subscriber; and (f) connecting the second subscriber to the voice call from the first subscriber if the second subscriber decides to be connected to the voice call.

20 In still another aspect of the present invention, there is provided a communication connecting apparatus including: a data processor for providing a wireless data communication service to a subscriber; and an

exchange for providing a speech channel between subscribers and a path between the subscriber and the data processor, and upon receiving an incoming voice call for the subscriber who is in communications, processing the incoming voice call depending on whether the subscriber is in connection

5 with the wireless data communication service provided by the data processor. The data processor informs the subscriber of the incoming voice call when the subscriber is in connection with the wireless data communication service, and causes the subscriber to decide whether to be connected to the incoming voice call. The exchange connects the subscriber to the incoming

10 voice call when the subscriber decides to be connected to the incoming voice call. The previous wireless data communication service status is stored in the terminal of the second subscriber so that the second subscriber can continue to use the previous wireless data communication service after the completion of the voice communication.

15 The second subscriber activates the stored wireless data communication service status to resume the previous data service after the termination of connection with the incoming voice call.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and

20 constitute a part of the specification, illustrate an embodiment of the invention, and, together with the description, serve to explain the principles of the invention:

FIG. 1 is a block diagram of an apparatus for selectively connecting to an incoming voice call received during a wireless data communication service according to an embodiment of the present invention; and

FIG. 2 is a flow chart of a method for selectively connecting to an incoming voice call received during a wireless data communication service according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following detailed description, only the preferred embodiment of the invention has been shown and described, simply by way of illustration of the best mode contemplated by the inventor(s) of carrying out the invention. As will be realized, the invention is capable of modification in various obvious respects, all without departing from the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not restrictive.

FIG. 1 is a block diagram of an apparatus for selectively connecting to an incoming voice call received during a wireless data communication service according to an embodiment of the present invention.

As shown in FIG. 1, the apparatus according to the embodiment of the present invention includes an exchange 100, a home location register (hereinafter referred to as "HLR") 200, a voice call processor 300, and a data processor 400.

The exchange 100 provides wireless voice and data communication

services to subscribers A and B. Between the exchange 100 and the subscribers A and B may be connected a base station (not shown) and a base station controller, or a second exchange unless both subscribers A and B are in the service area of the same base station.

5 Although it is described in this embodiment that use is made of mobile communication terminals, i.e., wireless data communication terminals supporting wireless data communication services, hardwired data communication terminals may also be used.

 The HLR 200 is connected to the exchange 100 for managing
10 additional service information and positional information for the mobile communication service subscribers.

 The voice call processor 300 is connected to the exchange 100 for processing an incoming voice call received at the exchange 100 when the subscriber concerned (i.e., subscriber A) is in communications. The voice
15 call processor 300 includes conventional systems, for example, VMS (Voice Mail System), UMS (Unified Message System) and other ARSs (Auto Response Systems).

 The data processor 400 is connected to the exchange 100 and Internet 500 for providing wireless Internet services or traffic-occupied bi-
20 directional text services to the subscriber A.

 The voice call processor 300 inquires from the data processor 400 whether the subscriber A is in connection with the wireless data

communication service. Then, the data processor 400 sends the inquiry result to the voice call processor 300.

The data processor 400 may also send a voice communication request message to the subscriber A who is currently in connection with the
5 wire data communication service.

That is, the data processor 400 includes a wireless Internet service provider 410 for providing a wireless Internet service, a traffic-occupied bi-directional text service provider 420 for providing a traffic-occupied bi-directional text service, and a subscriber status information processor 430 for
10 processing the status information of the subscriber A, especially use information of the wireless data communication service.

The wireless Internet service provider 410 and the traffic-occupied bi-directional text service provider 420 may be optionally included in the data processor 400.

15 For a HTTP in the wireless Internet service, since all operations are implemented in terms of request and response, the voice communication request message is sent to the subscriber A only by request for new data from the subscriber A.

If the wireless data terminal, i.e., mobile communication terminal is
20 connected to the TCP/IP (Transmission Control Protocol/Internet Protocol) after request and response procedures, the data processor 400 sends the corresponding data message to the mobile communication terminal.

Unless the TCP/IP connection is established, the data processor 400 attempts to send a data path establish message to the mobile communication terminal and sends the corresponding data message to the mobile communication terminal.

- 5 The data processor 400 can send the corresponding data message to the subscriber A immediately in response to a periodic request for data from the subscriber A using the mobile communication terminal, which is in connection with a data site that has a refresh function.

 The message sent to the subscriber A includes information about an
10 incoming voice call and a call back number for connection with the voice call.

 The voice call processor 300 connects the subscriber A to the originator of the incoming voice call, i.e., subscriber B when the subscriber A grants the new voice communication request. After termination of the voice communication between subscribers A and B, the subscriber A activates the
15 previous wireless data communication service status stored in the mobile communication terminal so as to resume the wireless data communication service.

 Hereinafter, a description will be given as to a method for selectively connecting to an incoming voice call received during a wireless data
20 communication service according to an embodiment of the present invention, with reference to FIGS. 2a and 2b.

 In this embodiment, it is assumed that subscriber B requests a voice

communication with subscriber A, who is in connection with a wireless data communication service provided from the data processor 400 via the exchange 100.

First, the subscriber B requests voice communication with the subscriber A who is in connection with the wireless data communication service from the data processor 400 via the exchange 100, in step 100. In this embodiment, it is assumed that the subscribers A and B are both located in the service areas under the control of the same exchange 100. The exchange 100 in charge of the service area for subscriber B requests positional information of subscriber A from the HLR 200, which in turn sends the positional information of the subscriber A to the exchange 100, in step 110. The exchange 100 positions the terminating subscriber A based on the positional (path) information of subscriber A that is received from the HLR 200, or inversely from a different exchange in charge of the service area for subscriber A by switching from HLR 200 to the exchange.

If subscriber A is located in the same service area as subscriber B, especially under the control of the same exchange, then the exchange 100 determines in step 120 whether the subscriber A is in communications.

Otherwise, if subscriber A is located in a different service area from subscriber B, the exchange connected to the subscriber B searches for and makes connection with the exchange 100 in charge of the service area for the subscriber A to determine whether the subscriber A is in communications,

said procedure being performed in a known manner. Although it is described in this embodiment that the subscribers A and B are located in the same service area and under the control of the same exchange 100, it would be readily understood to those skilled in the art that the subscriber A can be
5 located in a different service area from the subscriber B and under the control of a different exchange.

If the subscriber A is not in communications, the exchange 100 connects the voice communication request call of the subscriber A to establish voice communication between subscribers A and B, in step 130.

10 Otherwise, if the subscriber A is in communications, the exchange 100 switches the incoming voice call of the subscriber B to the voice call processor 300, in step 140.

Upon receiving the incoming voice call of the subscriber B from the exchange 100, the voice call processor 300 reserves the voice call in a non-
15 billing condition and then inquires from the data processor 400 whether the subscriber A is in connection with the wireless data communication service, in step 150.

The data processor 400 gets status information of the subscriber A from the subscriber status information processor 430 and sends the inquiry
20 result to the voice call processor 300, in step 160.

The voice call processor 300 determines in step 170 from the inquiry result received from the data processor 400 whether the subscriber A is

presently in connection with the wireless data communication service.

If the subscriber is not connected to the wireless data communication service, the voice call processor 300 connects the incoming voice call from the subscriber B to the VMS, UMS or other ARSs in a known manner, in step
5 180.

Otherwise, if the subscriber is presently connected to the wireless data communication service, the voice call processor 300 informs the data processor 400 of the incoming voice call for the subscriber A from the subscriber B, in step 190.

10 Simultaneously, the voice call processor 300 stores, in a built-in database, information including the number of subscriber A and the line number of the speech path used in connecting the voice call to the voice call processor 300.

Upon the voice call processor 300 informing of the incoming voice
15 call for the subscriber A who is in connection with the wireless data communication service, the data processor 400 makes out a notice message in the format of the wireless data communication service presently connected to the subscriber A and sends it to the subscriber A, in step 200. The notice message is displayed on the mobile communication terminal of the
20 subscriber A, in step 210.

In regard to this, the data processor 400 determines the format of the message for the subscriber A depending on whether the subscriber A is in

connection with a wireless Internet service from the wireless Internet service provider 410 or a traffic-occupied bi-directional text service from the traffic-occupied bi-directional text service provider 420.

In the case where the subscriber A is in connection with the wireless Internet service, the data processor 400 has to send the notice message in a different manner depending on whether the TCP/IP connection is established, or whether a refresh function is activated on the data site connected to the subscriber A.

The data processor 400 sends a select message for the subscriber A to determine whether to connect to the incoming voice call, as well as the notice message about the incoming voice call for the subscriber A. The select message includes a callback number for connection with the incoming voice call.

With a message such as "A voice call is ready for you. Select number 1 to connect or number 2 to hold" is displayed to the subscriber A, the subscriber A becomes aware of a new incoming voice call for him/her during the wireless data communication service and, if he desires to connect to the voice call, he selects number "1". Number 2 may also designate various functions other than "hold", including "reject", "reserve", "connect to voice call box" and "continue previous service", etc.

If the subscriber A does not want to connect to the new incoming voice call upon receiving the notice message during the wireless data

communication service, the voice call processor 300 connects the voice call switched from the subscriber B to VMS, UMS or other ARSs in a known manner, in step 230.

If the subscriber A wants to interrupt the wireless data communication service and connect to the new incoming voice call, the callback number is used to connect to the voice call processor 300. The voice call processor 300 compares the received originating subscriber number to the originating subscriber number stored in the built-in database, and establishes a speech path between the voice call switched from the subscriber B and the subscriber A being in connection with the wireless data communication service, in step 240. The status of the wireless data communication service currently connected to the subscriber A is stored in the mobile communication terminal of the subscriber A or the data processor 400.

After the termination of connection with the incoming voice call, the subscriber A can activate the previous status of the wireless data communication service stored in his/her mobile communication terminal and continue to receive the previous data service.

As described above, after the subscriber A is connected to an incoming voice call from the subscriber B during the wireless data communication service and terminates voice communication with the subscriber B, the mobile communication terminal of the subscriber A

activates the previous status of the wireless data communication service and gets in connection with the data processor 400 for new data, thereby switching to the previous data service environment and allowing the subscriber A to continue to have the previous data communication service.

5 Unlike the above description, in the case where the subscriber A is in communications and the exchange 100 has a separate unit for direct connection with the data processor 400, the exchange 100 may directly inquire from the data processor 400 whether the subscriber A is in connection with the wireless data communication service, and connect the
10 voice call from the subscriber B to the separate VMS, UMS and other ARS systems upon receiving a message indicating that the subscriber A is in connection with the wireless data communication service.

To indicate that the incoming call is a new call for the data service subscriber, the exchange 100 sends the corresponding information on the
15 inter-net call connection signal protocol (e.g., SS7 ISUP (ISDN User Part) R2-MFC).

As such, the call can be switched to a selectively limited system as the exchange 100 directly determines that the subscriber A is in connection with the wireless data communication service.

20 Although it has been described that the exchange 100 inquires from the data processor 400 whether the subscriber A is in connection with the wireless data communication service, the exchange 100 may store in the

HLR 200 information indicating whether the subscriber A is using the data service. In this case, a separate path for data transmission is needed between the HLR 200 and the data processor 400.

When the exchange 100 requests path information from the
5 exchange in charge of the terminating subscriber A (alternatively, a second exchange to be connected to the subscriber A) via the HLR 200, the corresponding exchange directly informs the HLR 200 that the subscriber A is in connection with the wireless data communication service, to store in the HLR 200 information indicating whether the subscriber A is using the data
10 service.

If the corresponding information is not stored in the HLR 200 but is sent to the originating exchange, the originating exchange may process the voice call at the VMS, UMS and other ARSs connected thereto.

While this invention has been described in connection with what is
15 presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

20 The present invention allows a subscriber to receive an incoming voice communication request message from another subscriber during connection with the wireless data communication service with a wireless data

terminal and get in voice communication with the second subscriber originating the voice call communication.

WHAT IS CLAIMED IS:

1. A communication connecting apparatus comprising:
 - a data processor for providing a wireless data communication service to a subscriber;
 - 5 an exchange for providing a speech channel between subscribers and a path between the subscriber and the data processor; and
 - a voice call processor connected to the exchange and the data processor for processing an incoming voice call for a subscriber who is in communications, depending on whether the subscriber is in connection with
 - 10 the wireless data communication service provided by the data processor,
 - the data processor informing the subscriber of the incoming voice call when the subscriber is in connection with the wireless data communication service, and causing the subscriber to decide whether to be connected to the incoming voice call,
 - 15 the voice call processor connecting the subscriber to the incoming voice call, when the subscriber decides to be connected to the incoming voice call.
2. The communication connecting apparatus as claimed in claim 1,
- 20 further comprising a home location register connected to the exchange for managing additional service information and positional information of the subscriber.

3. The communication connecting apparatus as claimed in claim 1,
wherein the data processor comprises:

a wireless network service provider for providing a wireless network
5 service to the subscriber via the exchange;

a traffic-occupied bi-directional text service provider for providing a
traffic-occupied bi-directional text service to the subscriber via the exchange;
and

a subscriber status information processor for processing status
10 information of the subscriber.

4. The communication connecting apparatus as claimed in claim 3,
wherein the status information of the subscriber includes information
indicating whether the subscriber is currently in connection with the wireless
15 data communication service.

5. The communication connecting apparatus as claimed in claim 1,
wherein the voice call processor inquires from the data processor whether
the subscriber is in connection with the wireless data communication service
20 provided by the data processor.

6. The communication connecting apparatus as claimed in claim 1,

wherein the voice call processor stores the wireless data communication service status for the subscriber prior to connecting the subscriber to the incoming voice call, and activates the stored wireless data communication service status to continue the previous wireless data communication service
5 when the subscriber desires to resume the previous wireless data communication service after the termination of connection with the voice call.

7. A communication connecting method comprising the steps of:

(a) a first subscriber requesting a voice communication with a
10 second subscriber;

(b) determining whether the second subscriber is in communications;

(c) determining whether the second subscriber is in connection with a wireless data communication service if the second subscriber is in communications;

15 (d) sending a message to the second subscriber indicating that there is an incoming voice call from the first subscriber, in a data format used in the wireless data communication service, if the second subscriber is in connection with the wireless data communication service;

(e) causing the second subscriber to decide whether to be
20 connected to the voice call from the first subscriber; and

(f) connecting the second subscriber to the voice call from the first subscriber if the second subscriber decides to be connected to the voice call.

8. The communication connecting method as claimed in claim 7, wherein the connecting step (f) includes the step of storing the wireless data communication service status for the second subscriber.

5

9. The communication connecting method as claimed in claim 8, further comprising the steps of:

after the connecting step (f), determining whether the second subscriber desires to resume the previous wireless data communication

10 service; and

activating the stored wireless data communication service status, if the second subscriber desires to resume the previous wireless data communication service.

15

10. A communication connecting apparatus comprising:

a data processor for providing a wireless data communication service to a subscriber; and

an exchange for providing a speech channel between subscribers and a path between the subscriber and the data processor, and upon
20 receiving an incoming voice call for the subscriber who is in communications, processing the incoming voice call depending on whether the subscriber is in connection with the wireless data communication service provided by the

data processor,

the data processor informing the subscriber of the incoming voice call when the subscriber is in connection with the wireless data communication service, and causing the subscriber to decide whether to be
5 connected to the incoming voice call, and

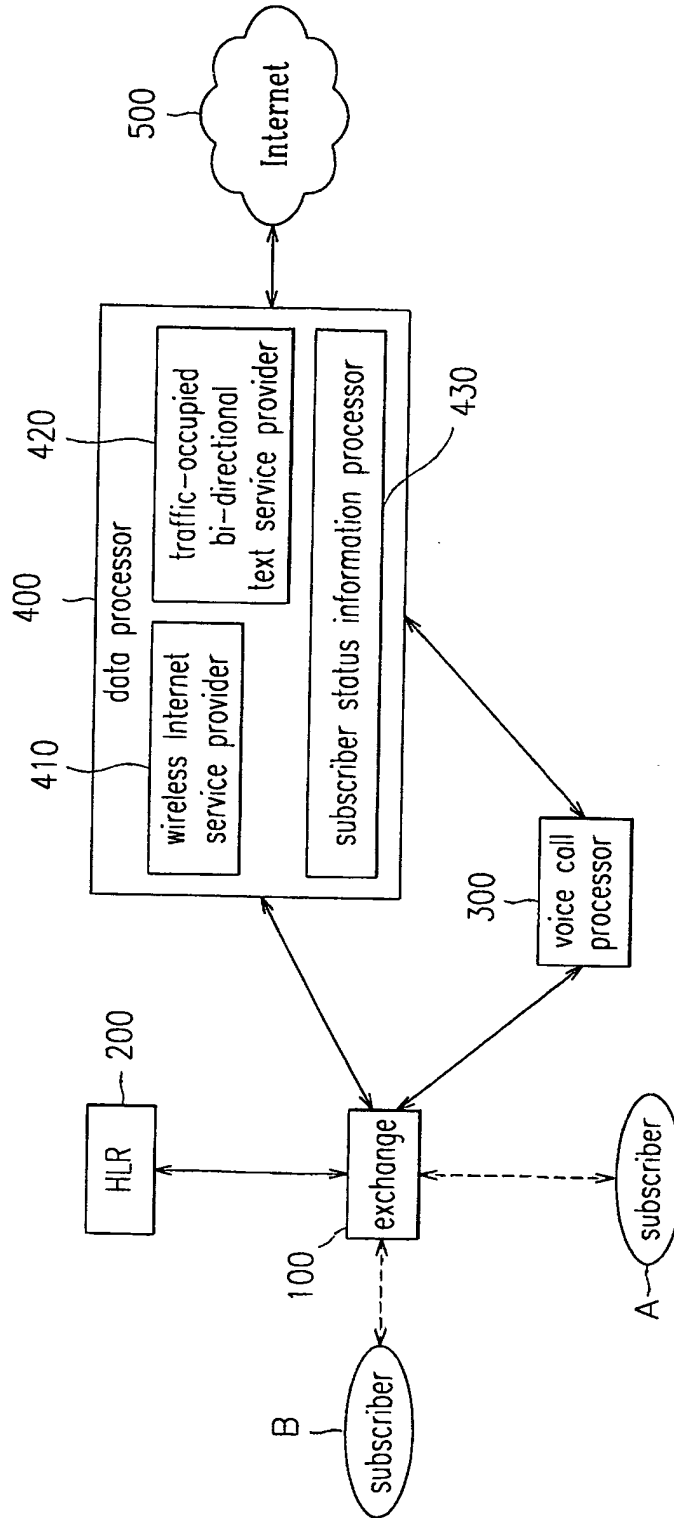
the exchange connecting the subscriber to the incoming voice call when the subscriber decides to be connected to the incoming voice call.

11. The communication connecting apparatus as claimed in claim 10,
10 further comprising a home location register connected to the exchange for managing additional service information and positional information of the subscriber.

12. The communication connecting apparatus as claimed in claim 11,
15 wherein the home location register stores information indicating whether the subscriber is in connection with the wireless data communication service provided by the data processor.

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FIG. 1



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FIG. 2a

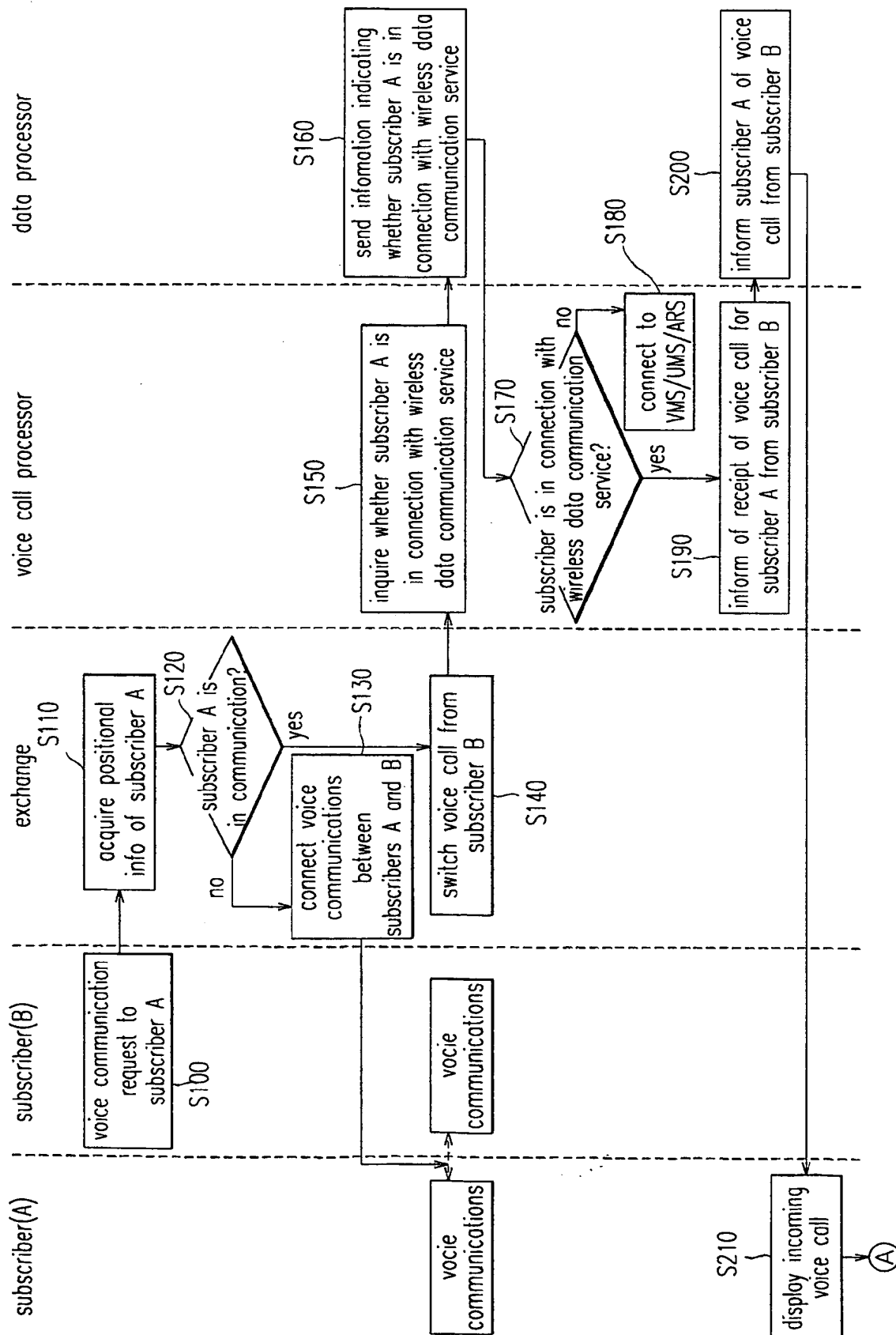
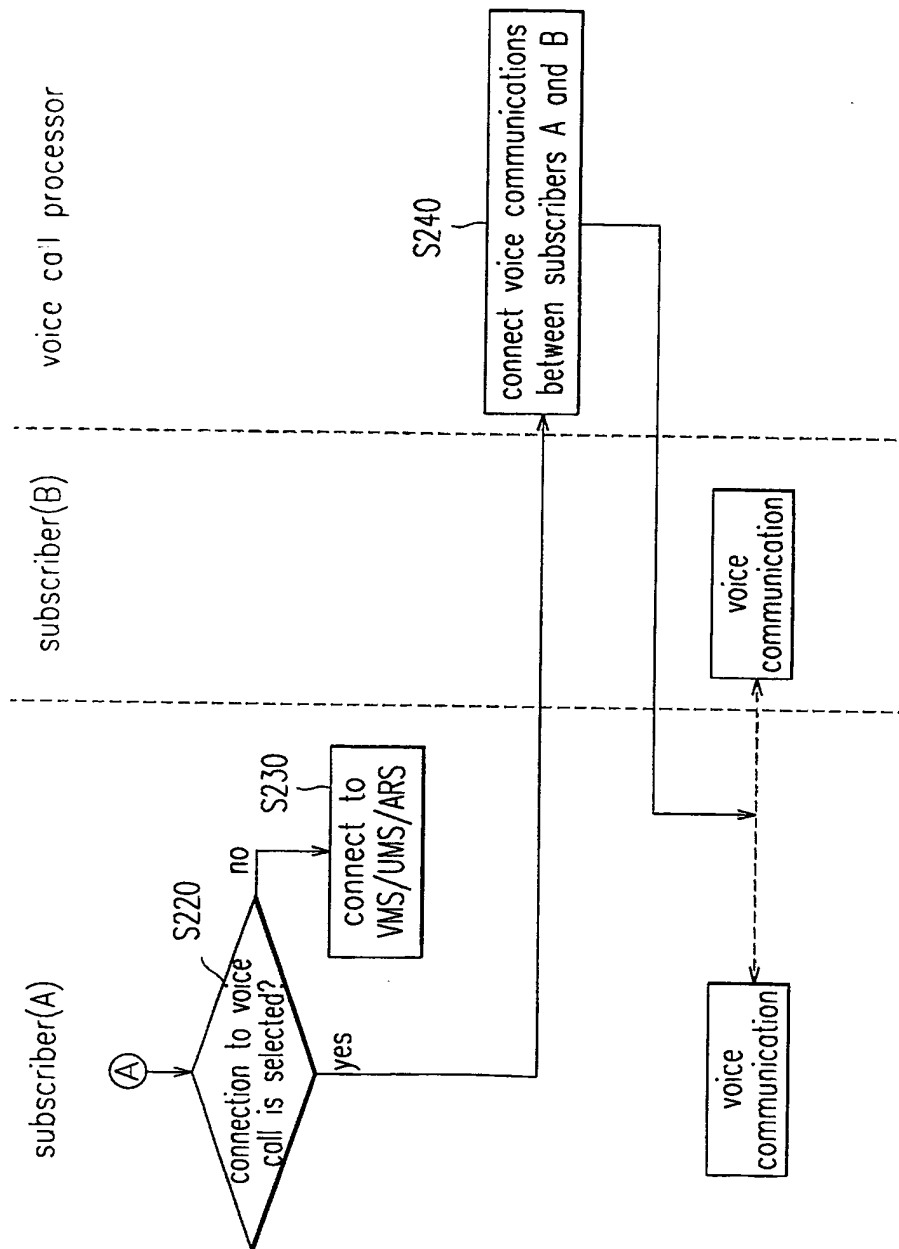


FIG.2b



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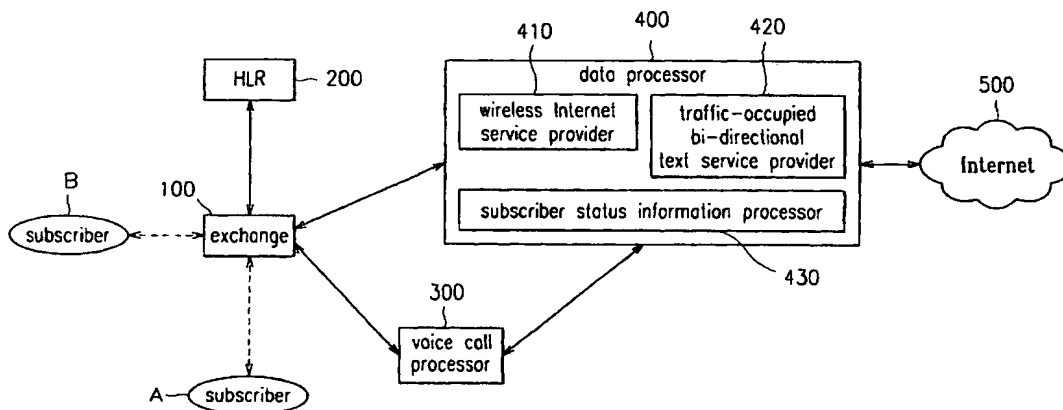
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[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR SELECTIVELY CONNECTING TO AN INCOMING VOICE CALL RECEIVED DURING WIRELESS DATA COMMUNICATION



(57) Abstract: An exchange (100) provides wireless voice and data communication services to the subscribers (A, B). A subscriber (A) is connected to a wireless data communication service provided by data processor (400). An incoming voice call, originated by another subscriber (B) and directed to said subscriber (A) is received at the exchange (100) and processed by a voice call processor (300), inquiring from the subscriber status information processor (430) whether said subscriber (A) is in connection with the wireless data communication service. Responsive to said inquiry the data processor (400) informs subscriber (A) of the incoming voice call by means of a data message directed to the mobile communication terminal of said subscriber (A). If subscriber (A) decides to take the incoming voice call the voice call processor (300) connects the two subscribers (A, B). Prior to connecting the two subscribers (A, B) the current status of the data communication is stored to re-establish wireless data communication service after termination of the incoming voice call.

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CLASSIFICATION OF SUBJECT MATTER

IPC⁷: H04Q 7/22, H04M 3/428, H04M 11/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁷: H04Q, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR 01/01716

| Patent document cited in search report | | | Publication date | Patent family member(s) | | | Publication date |
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